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## Small Vessel Disease

February 5, 2002 (Reviewed: September 11, 2003)

### Question

What is small vessel disease and what are the treatments?

### Answer

There are two major categories of blood vessel diseases: peripheral arterial diseases, which are disorders of the vessels carrying blood from the heart to all parts of the body, and peripheral venous diseases, which are disorders of the vessels carrying deoxygenated blood back to the heart. Both lead to insufficient oxygen reaching the farthest parts of the blood circulation.

As the blood vessels travel away from the heart they become smaller and smaller. The smallest are found where the small arteries (arterioles) gradually form the veins (venules). Patients with small vessel disease have problems in this part of the circulatory anatomy.

Small vessel arterial disease may result from obstruction, which hinders the flow of blood; from disorders of the muscles in the artery walls, causing them to either constrict or dilate; or from aneurysms, which are weakened vessel segments that fill with blood and balloon outward. The formation of atherosclerotic, or fatty, deposits along the inner arterial walls is the most common arterial disease. When these deposits seriously obstruct the coronary arteries, a heart attack or symptoms of coronary disease are the common result; when arteries supplying blood to the brain are blocked, a stroke may ensue. Similarly, arteries supplying other parts of the body may become partially or fully blocked, leading to a condition referred to as chronic occlusive arterial disease.

When the lower limbs are affected by occlusive arterial disease from fatty deposits, the disorder is called arteriosclerosis obliterans. The typical patient is a man over 50 who smokes, has high blood cholesterol, and who may also have diabetes. There are, of course, exceptions; people with a family history of early arteriosclerosis and people with diabetes, high blood pressure, or very high blood lipids may develop arteriosclerosis obliterans at an earlier age.

In the early stages of arteriosclerosis obliterans, the major arteries carrying blood to the legs and feet become progressively narrowed. Smaller collateral (alternative) blood vessels branching off the major arteries increasingly take over the supply of blood to the limb. But these collateral vessels are often inadequate to meet extra demands, such as walking for more than a short distance. Thus, the early symptoms of arteriosclerosis obliterans are cramp-like pains, aching, or muscle fatigue in the calves that occur during exercise; these symptoms are referred to as intermittent claudication. The site of the pain is determined by which arteries are occluded.




As the disease progresses, discomfort may occur even at rest. This disease may also cause a decrease in hair on the extremities. Eventually, the skin that is chronically deprived of sufficient oxygen and nutrients will begin to break down, resulting in superficial ulcers. These ischemic ulcers are small in the beginning and are generally located on the foot, toes, or heel. In severe cases, gangrene may develop, resulting in amputation of the affected part.

Arteriosclerosis obliterans can be diagnosed by feeling the pulses and measuring the pattern of circulation to the lower limbs with various techniques. Treatment consists of drugs that widen the blood vessels (e.g. pentoxifylline) and anti-clotting drugs such as aspirin, though this may be of little benefit in peripheral vascular disease. Co-existent diseases, such as diabetes or high blood pressure, must be treated too.

If medical measures are not effective, surgery or balloon angioplasty may be advised. There are 2 major types of operation: revascularization, in which the blocked arteries are bypassed with either healthy blood vessels taken from elsewhere in the body or synthetic material; or endarterectomy, which involves opening portions of the diseased artery and removing the atherosclerotic deposits. Balloon angioplasty, in which a catheter with a balloon tip is inserted into an artery and inflated to compress the fatty deposits, is most successful with small segments of blockage. However, the area becomes quickly re-blocked in about 30% of all cases, requiring repeated treatment within a year or two. Another technique, laser ablation, uses a laser instead of a balloon to open the blocked vessel. It has several advantages over conventional surgery: it's faster, needs a shorter hospital stay, and doesn't require a bypass graft.

If the patient smokes, stopping completely is an essential first step, since smoking not only hinders the delivery of oxygen but also impairs development of collateral circulation. Proper weight control is also very important. Exercise is an integral part of the overall treatment program. A graduated walking program can improve collateral circulation and improve symptoms. Foot care is particularly important; comfortable, properly-fitting shoes and socks and protecting the feet from injury or infection are crucial.

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